TITLE

LCD PANEL WITH COMMON VOLTAGE ADJUSTER

BACKGROUND OF THE INVENTION

Field of the Invention

The present invention relates to an LCD panel, and in particular to an LCD having a common voltage adjustment.

Description of the Related Art

Fig. 1A is an equivalent circuit diagram of a pixel of the conventional TFT-LCD. In Fig. 1A, the circuit of each pixel has a data line (DL), bit line (BL), thin film transistor (M), compensation capacitor (C) and equivalent capacitor (Lc). The data line (DL) is connected to the source terminal (S) of the thin film transistor (M). The bit line (BL) is connected to the gate terminal (G). The equivalent capacitor (Lc) produced by the liquid crystal in the LCD panel and the compensation capacitor (C) are disposed between the drain terminal (D) and the ground terminal.

Fig. 1B is an output waveform of the conventional TFT-LCD. V_{DL} represents the voltage of the data line (DL). V_{BL} represents the voltage of the bit line (BL). V_c is the average voltage of the data line (DL). V_{com} is the voltage of the ground terminal. V_o is the voltage over the equivalent capacitor (Lc). Moreover, T_1 is the selected period, and T_2 is the non-selected period of the bit line (BL).

Referring to Figs. 1A and 1B, during the selected period (T_1), V_{BL} is high, and the gate terminal (G) of the thin film transistor (M) is in forward-active mode, such that the voltage (V_o) over the equivalent capacitor (Lc) is equal to the voltage (V_{DL}) of the data line. At the time when V_{BL} becomes low, the gate terminal (G) is cutoff. The voltage (V_o) drops by ΔV immediately because of the parasitic capacitor between the gate terminal (G) and the drain terminal (D) of the thin film transistor (M). Further, the voltage V_o decays within the non-selected period (T_2) because of the current leakage. After V_{BL} becomes high again, the equivalent capacitor (Lc) are re-charged.

Because the voltage drop ΔV has no relationship with the direction of the data line voltage (V_{DL}), the output voltage (V_o) always drops a voltage by ΔV, which depends on the fabricating conditions of the thin film transistor (M). Therefore, the output voltage (V_o) is not symmetrical. The TFT-LCD panel may flash, and the illumination of the image is unstable.

SUMMARY OF THE INVENTION

Accordingly, an object of the present invention is to provide a LCD panel with a adjustment to shift the output voltage acting on the liquid crystal, such that the illumination of the LCD panel becomes more uniform and stable.

The present invention provides an LCD panel having a common electrode and a sliding adjustment disposed thereon. The sliding adjustment is connected to the

common electrode and has a guiding groove and a sliding piece therein. The sliding piece can be shifted in the guiding groove to change the common voltage of the common electrode, unifying the illumination of the LCD panel.

In a preferred embodiment of the present invention, the LCD panel has a ground terminal, and the sliding adjustment is disposed between the common electrode and the ground point. Each pixel of the LCD panel has a compensation capacitor connected to the common electrode. The sliding adjustment is a sliding variable resistor, which is to change the resistance between the common electrode and the ground terminal, unifying the illumination of the LCD panel.

The present invention also provides another embodiment. An LCD panel has a sliding adjustment disposed thereon. The sliding adjustment has a guiding groove and a sliding piece therein. The sliding piece can be shifted in the guiding groove to change a resistance acting on the LCD panel.

A detailed description is given in the following embodiments with reference to the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

The present invention can be more fully understood by reading the subsequent detailed description and examples with references made to the accompanying drawings, wherein:

Fig. 1A is an equivalent circuit diagram of a pixel of the conventional TFT-LCD;

Fig. 1B is an output waveform of the conventional TFT-LCD;

Fig. 2A is an equivalent circuit diagram of the present invention.

Fig. 2B is a schematic view of a LCD panel of the invention;

Fig. 3A is a schematic view of a LCD panel of another embodiment;

Fig. 3B is a front view of a LCD panel of another embodiment.

DETAILED DESCRIPTION OF THE INVENTION

Fig. 2A is an equivalent circuit diagram of the present invention. In order to stabilize the illumination of the LCD panel, each pixel of the LCD panel is connected to a common electrode 7. A variable resistor 12 is electrically connected to the common electrode 7 and the ground terminal 9 of the LCD panel. The voltage of the common electrode V_{com} is tunable to approach the average voltage (V_c) of the data line (DL), such that the waveform of V_o is more symmetric.

Fig. 2B is a schematic view of a LCD panel of the invention. In Fig. 2B, a variable resistor 12 is disposed on the backside print circuit board 11(PCB) of a TFT-LCD panel 10. A variable resistor 12 is electrically connected to a common electrode of each pixel and the ground terminal of the TFT-LCD panel 10. The variable resistor 12 can be tuned by a tool 13 when the panel 10 is finished and ready to leave the factory. The common

voltage of each panel can be individually tuned, such that the illumination is optimized.

However, it is sometimes not convenient to use the specific tool 13 to tune the variable resistor 12 used in Fig. 2B. The present invention provide another embodiment shown in Fig. 3A. In Fig. 3A, the TFT-LCD panel 20 includes a plurality of pixels as shown in Fig. 2A. The equivalent capacitor (Lc) and the compensation capacitor (C) are connected to a common electrode 7. A sliding variable resistor 22 is electrically connected to a common electrode 7 of each pixel and the ground terminal 9 of the TFT-LCD panel 10 to change the common voltage (V_{com}). In Fig.3A, the sliding variable resistor 22 is disposed on the backside PCB 21 of a TFT-LCD panel 20. The sliding variable resistor 22 has a guiding groove 22a and a sliding piece 22b disposed therein. The sliding piece 22b can be shifted in the guiding groove 22a to change the common voltage (V_{com}) of the common electrode 7, unifying the illumination of the TFT-LCD panel 20. The sliding variable resistor 22 can be tuned simply by fingers, which saves the calibration time.

Furthermore, variable resistors can be adjustments of some display conditions of a TFT-LCD panel 20. In Fig. 3B, the sliding variable resistors 22 are disposed above the display area 23 or other positions. The sliding pieces 22b are shifted in the guiding groove 22a to change the acting resistance of the variable resistors, such that the display conditions of a TFT-LCD panel 10 can be easily optimized.

While the invention has been described by way of example and in terms of the preferred embodiments, it is to be understood that the invention is not limited to the disclosed embodiments. To the contrary, it is intended to cover various modifications and similar arrangements (as would be apparent to those skilled in the art). Therefore, the scope of the appended claims should be accorded the broadest interpretation so as to encompass all such modifications and similar arrangements.